Deploying Emerging Technologies in U. S. Federal Buildings through ESPC

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The Department of Energy's Federal Energy Management Program's (FEMP) mission is to facilitate the Federal Government's implementation of sound, cost-effective energy management and investment practices to enhance the nation's energy security and environmental stewardship.

Deploying Emerging Technologies

- Goals/Objective
- Define emerging technologies
- Examples of emerging technologies in ESPC projects - lessons learned
- Describe actions taken to incorporate ET in ESPCs
- Results to date
- Feedback, suggestions

Emerging Technologies in ESPCs

Goal/Objective:

-Tool to help reach Executive Order 13423, EPACT 2005 and EISA energy use reduction goals

-Means to acquire energy savings otherwise not attainable, and build larger ESPC/UESC projects & projects that would not be otherwise feasible

"Emerging Technologies"?

Definition:

New and emerging technologies will be defined as applicable to existing buildings, developed beyond bench-test status, ready for beta-testing at a minimum, commercially available through a private-sector partner, or already in the commercial market but with minimal market penetration in the federal building sector.

Examples of ET in ESPCs

2006 case studies

- **San Diego VA- Ultra Low NOx Turbine Cogen System**
- **Ft. Stewart- Super T-8 Lighting Technology**
- **Luke AFB- Integrated Cool/ PV Roofing System**
- **Ft. Irwin –HID to T-5 Hi- bay Lighting**
- **BOP Victorville- Wind Turbine and PV**
- **NAS Oceana- Waste water reuse/energy recovery**
- **EPA Ann Arbor- Fuel Cell**

San Diego VA- Ultra Low NOx Turbine Cogen System

Ft. Irwin –HID to T-5 Hi- bay Lighting: Pre-Retrofit

Ft. Irwin –HID to T-5 Hi- bay Lighting: Post-Retrofit

ET in ESPC- Lessons Learned

- **Projects require a mix of motivation and tolerance amongst project partners: partners are either motivated to incorporate the technology into the project or tolerant to have it as part of the project.**

- **Technologies can be the idea of the federal agency, ESCO and /or third party.**

- **Perceived risks need to identified managed and/ or mitigated**

ET in ESPC- Lessons Learned

- *Risk can be reduced by being properly shared among the parties , and by acquiring more detailed technical information*

Bureau of Prisons, Victorville CA

ET in ESPC- Lessons Learned

- **Utilize technology experts from the National Labs and private sector to educate stakeholders, emphasizing value/benefits**
- **Positive relationships and trust among all parties is critical**
- **Need to be flexible and provide a customized approach to meet customer needs**
- **Applicable financial incentives can help offset first costs**

ET Deployment Action Plan to date

Steps/Tasks

- **Identified, cataloged, and prioritized technologies into FEMP Emerging Technology Matrix**
  - Alliance to Save Energy (ASE), FEMP, LBNL, other DOE Labs
  - Input from CA Emerging Technologies Council, Navy Techval program, others
- **Preliminary market assessment**
- **Developed/identified 1-2 page technology fact sheets**
- **Identified technology expert(s) and availability of technical assistance**

ET Deployment → Action Plan

- **Disseminate new technology information to field (Educate PFs, Agencies, ESCOs)**
  - ESCO project development engineers critical
  - If application matches are found, coordinate technical assistance.
  - If necessary, small demo (if scalable) during the DES phase to confirm feasibility/acceptability
  - Implement technology on larger scale via ESPC

- **Identify any applicable financial incentives, prototypes, cost sharing opportunities, other funding sources**.

Emerging Technology (ET) Matrix

- The Emerging Technology (ET) Matrix is an Excel spreadsheet tool to assist agencies and ESCOs:
  - Identify emerging technologies for Federal ESPC/UESC projects.
  - Provide references for additional information, points of contact, and resources.
  - Save research time and provide better direction in making Energy Conservation Measure (ECM) decisions.

- ECM Categories
  - Building Envelope
  - HVAC
  - HighTech Buildings
  - Lighting
  - Power Generation
  - Water/Wastewater
  - Water Heating
  - Other

FEMP ET Matrix Websites

FEMP Emerging Technology Matrix

- http://www1.eere.energy.gov/femp/docs/emerging_tech_matrix.xls

Alliance to Save Energy Emerging Technology Report

- http://www1.eere.energy.gov/femp/pdfs/emerging_technologies_ase_report.pdf

ESCO/Agency Review and Support

- **In the early stages of project development, agency customers will be provided an Emerging Technologies (ET) Matrix**
- **Agencies are requested to review the ET Matrix for potential saving opportunities**
- **FFS/PF will schedule a meeting with agency to go over the ET Matrix in more detail and identify potential ET ECMs**

ET Matrix: Federal Sector Applicability

Example – Scotopic Lighting

▲ High ► Medium ▼ Low

Lighting					
Technology	Federal (Market) Leverage	Savings Potential		Cost Effectiveness	Retrofit Applicability
		Federal	US economy		
Scotopic Lighting	▲	▲	►	▲	▲

ET Matrix: ESPC Applicability

Example – Scotopic Lighting

A	All or most federal facilities
M	Many federal facilities
S	Special conditions (see measure description)

Technology	ESPC Applicability	Application	Description
Scotopic Lighting	**A**	Residential and Commercial	Optimized color temperature for improved visual effectiveness even at dimmed light output

ET Matrix: Information Sources

	Report Type	Source	Date	URL
Scotopic Lighting	Website	DOE	2007	http://www1.eere.energy.gov/femp/new_technology/techdemo_comp5.html
	2-pager	FEMP	2007	Download
	ACEEE Study (p. 134)	ACEEE	2004	http://www.aceee.org/pubs/a042full.pdf
	Field Evaluation	PNNL	2006	http://www.eere.energy.gov/buildings/info/documents/pdfs/selpies_field_eval_083006.pdf
	Economic Analysis	DOE	2006	http://www.eere.energy.gov/buildings/info/documents/pdfs/selpies_economics_validation_083006.pdf

ET Deployment → Action Plan

- **Incorporate into ESPC training, kickoff meetings, Core Team technical assistance**
- **Promote and highlight quick/early success stories**
- **Venues include: PF/ESCO, FUPWG, E20XX, NAESCO, FEMP webpage, etc**
- **Conduct Evaluations/Assessments**
- **Develop case studies**
- **Gather additional success stories and disseminate information**
- **Developing a multi-year program plan**

Results: ESPCs with Scotopic Lighting

- **BOP AZ- $953,574 investment, $184,870 annual savings. Awarded 03/08.**
- **DOE ORNL- $1.8M investment, $160K savings. Awarded 07/08.**
- **US Army Korea- $ 17,723,598 investment, $1,876,1605 annual savings. In DES phase.**
- **USDA Forest Products Lab, WI. $39,971 investment, $2,388 savings. Awarded 08/09.**
- **BOP-Lompoc, Victorville #2.**
- **GSA - PJKK Fed. Bldg., HI, Long Beach & Santa Ana, CA.**
- **DOE - Forrestal & Nevada Test Site.**

Results: Other ET Matrix Applications

- **Aerosol Duct Sealing – Architect of the Capital**
- **Lab Air Flow/Fume Hoods – DOE: BNL, USFS FPL, LANL**
- **Bay Source Heat Pump – FDA Puerto Rico**
- **Advanced Metering – DOE: ORNL, LLNL, PPPL, SLAC, NETL**
- **Biomass Electric Generation or Boilers – NETL, NREL, ORNL, Savannah River, USFS Regions 2 & 4, Fairton FCI**
- **PV – DOE: NTS, PNNL, PPPL, HQ, LLNL, NETL; USFS Region 2**
- **Wind power – NETL, Forest Service Region 2 & 4**
- **Cool/Green Roof – NETL, GSA PJKK Fed Bldg**
- **Indoor/Outdoor LED fixtures – US Army Korea**
- **Induction Lighting – Ft. Irwin**
- **Data Centers – DMDC, GSA Region 7**
- **Superboiler – ORNL**

ET Deployment  Action Plan

- **Other Ideas**
  - **Assess Greenhouse gas abatement potential**
  - **Develop technology specific technical assistance tools based on user needs**
  - **Demonstration project funding**
  - **FEMP should form partnerships with industry**
  - **Periodic Technology Updates/Training**

ET Deployment  Action Plan

Feedback/suggestions?

Applicability to your projects?

Renewable Energy (RE) Screening

- Prior to the Preliminary Assessment (PA), agency customers are requested to provide site data needed for RE screening
- Site data may also be used for screening other power generation and emerging energy saving technologies

Renewable Energy (RE) Screening

- Biomass and Alternative Methane Fuels (BAMF)
- Solar
  - Photovoltaics (PV)
  - Concentrating Solar Power (CSP)
- Wind
- Other Power/Emerging Technologies
  - Geothermal Heat Pumps (GHPs)
  - Combined Heat and Power (CHP)

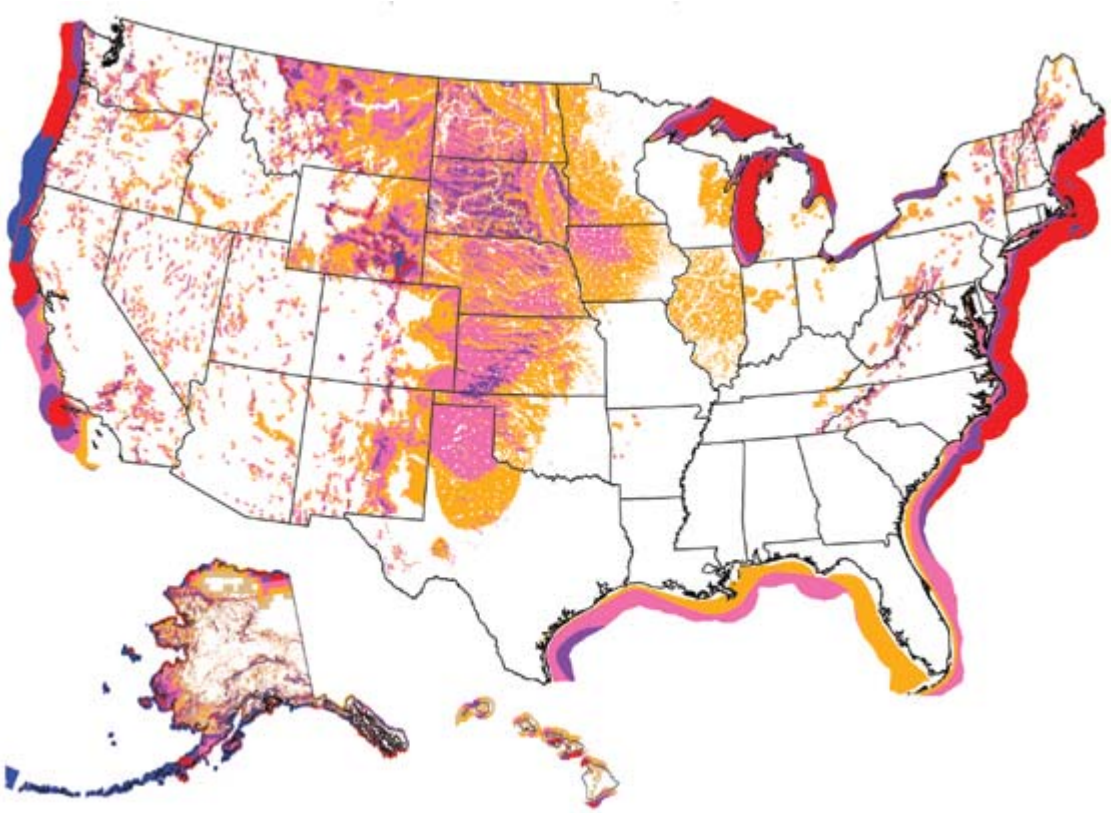
Site Data Needed for RE Screening Report

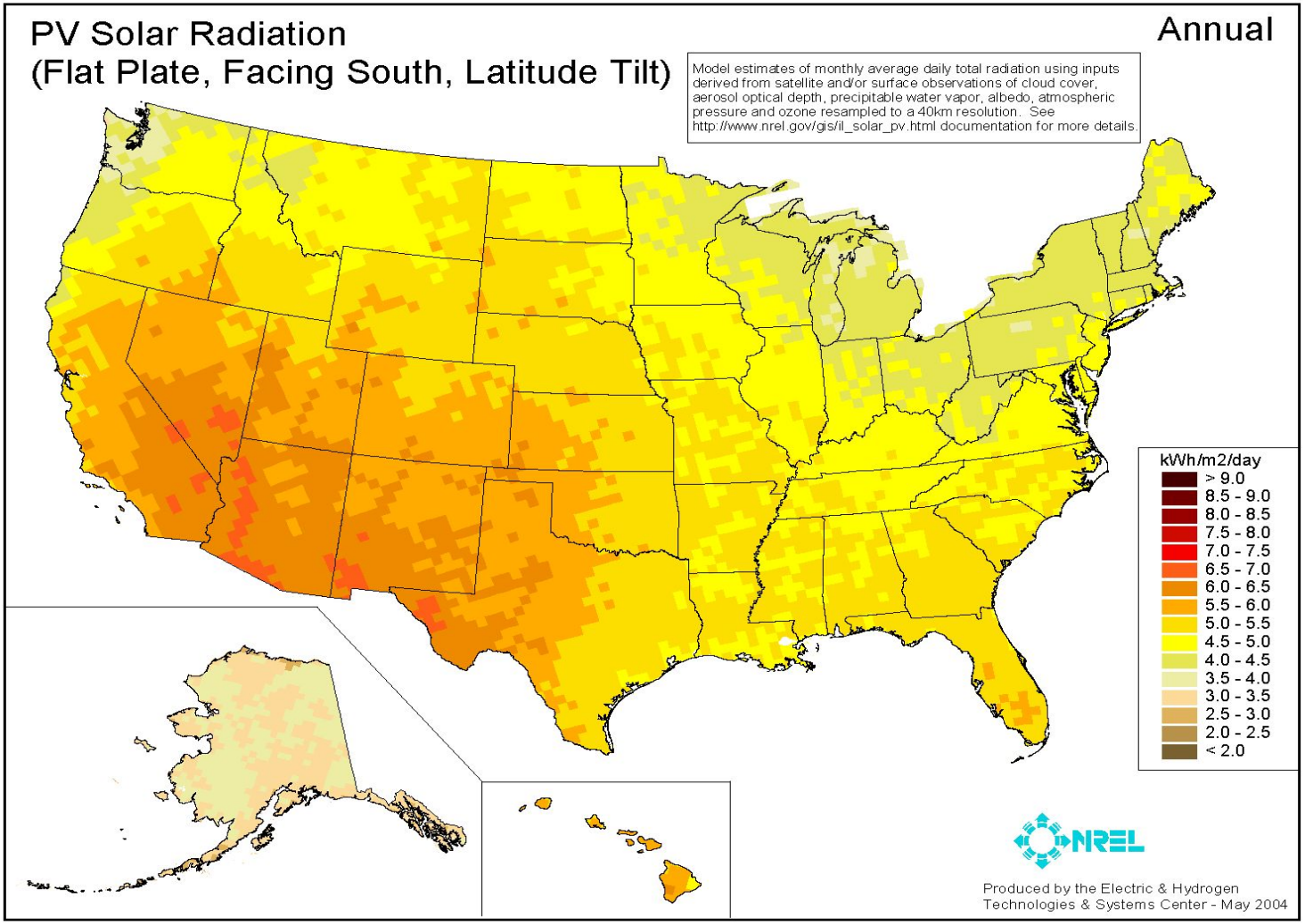
- Site Location: Lat/Long (preferred) or address
- Utility Info
  - Electric
    - Rate _____$/kWh (Blended $/kWh: annual $/annual use)
    - Annual Energy Use _____ kWh
    - Annual Peak Demand _____kW _____ month
  - Natural Gas
    - Rate _____$/therm or $/decatherm (select units)
    - Annual Use _____ therm or decatherm (select units)
  - Water
    - Rate _____$/KGal
    - Annual Use _____ KGal
- Land Area Available for Power Generation _____ acres
  - Compatible with mission
  - Lat/Long if available

Additional Site Data Questions

- Is there a waste water treatment plant on site?
- Is there a landfill on site?
- Is there wood waste production on site?
- Are there any existing geothermal heat pump systems on-site, or have any thermal conductivity tests been performed for potential projects?
- Are large volumes of groundwater being brought to the surface (for example, as part of a remediation project) or are there large volumes of wastewater available at the site?
- Are large surface bodies of water, e.g., ocean, lake, river, available at/near the site?

Wind Resources in America




PV Solar Radiation
(Flat Plate, Facing South, Latitude Tilt)
Annual
Model estimates of monthly average daily total radiation using inputs derived from satellite and/or surface observations of cloud cover, aerosol optical depth, precipitable water vapor, albedo, atmospheric pressure and ozone resampled to a 40km resolution. See http://www.nrel.gov/gis/il_solar_pv.html documentation for more details.
kWh/m2/day
> 9.0
8.5 - 9.0
8.0 - 8.5
7.5 - 8.0
7.0 - 7.5
6.5 - 7.0
6.0 - 6.5
5.5 - 6.0
5.0 - 5.5
4.5 - 5.0
4.0 - 4.5
3.5 - 4.0
3.0 - 3.5
2.5 - 3.0
2.0 - 2.5
< 2.0
NREL
Produced by the Electric & Hydrogen Technologies & Systems Center - May 2004

For more information on how to identify potential for renewables

Kate Anderson, NREL Kate_Anderson@nrel.org

For biomass

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For GHP and CHP

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Would you like to know more about this presentation?

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